Coefficient of Thermal Expansion

Like all materials, Foamalite sheets are subject to a change in dimensions with changing ambient temperatures. This characteristic can be quantified by determining the linear coefficient of expansion (a), which considers the linear increase of a material per increase in temperature. The following table lists values for common materials used for the construction industry:

Linear Coefficient of Thermal Expansion Data

Material	a Value (m/m/K)	a Value (mm/m/K)
Aluminium	23.8×10^{-6}	0.0238
Concrete	12.0×10^{-6}	0.011
Brass	18.5×10^{-6}	0.0185
Steel	12.0×10^{-6}	0.0115
Timber	40.0×10^{-6}	0.04
Quartz Glass	$.5 \times 10^{-6}$	0.0005
Polymeric Materials	$40\text{-}200 \times 10^{-6}$	0.040-0.200
Acrylic	75.0×10^{-6}	0.075
Foamalite F Sheet	50×10^{-6}	0.05

A change in linear length (DL) can be calculated using the following equation:

$$DL = L \times Dt \times a \text{ where } Dt = t_{max} - t_{min}$$

Symbols

DL = Linear change in length (m)

L = Original length (m)

Dt = Change in temperature (K)

a = Linear Coefficient of thermal expansion (m/m/K)

t_{max} = Maximum temperature of sheet (K)

t_{min} = Minimum temperature of sheet (K)

A possible linear change in length should be considered during installation to prevent the introduction of stresses in the mounted sheet. Excessive stresses can lead to deformation (warping) and even cracking.

Even in a European climate, a considerable change in ambient temperatures can be observed (-20 to 50 °C) and the maximum ambient temperature can be further increased if direct sunlight effects are relevant. The technical staff at Foamalite would be pleased to provide assistance on a case-to-case situation.

Sheet Temperature (°C)	Dimensionnel Change (mm)	
	DL	DW
0	- 2.44	- 1.22
10	- 1.22	- 0.61
20	0	0
30	+ 1.22	+ 0.61
40	+ 2.44	+ 1.22
50	+ 3.66	+ 1.83

The value taken for **D** is an approximate value and is not truly constant with temperature for thermoplastics.

The fixing technique must allow for the effects of thermal expansion /constriction by estimating the change in dimensions over the anticipated service